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EXAMINER	
LAMB, CHRISTOPHER RAY	

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2652	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/065,882	HARDING, KEVIN GEORGE	
	Examiner	Art Unit	
	Christopher R. Lamb	2652	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,7-10,13,14,16-18,20 and 22* is/are rejected.

7)☒ Claim(s) *5,6,11,12,15,19 and 21* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 November 2002* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: 302, 304, 306, etc.; in short, nearly all characters in Fig. 3. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informalities: In paragraph 22, line 5, “detector 408” should probably be “detector 404.”

In paragraph 21, lines 9-10, the phrase “deconvolving the holographically stored data and the correlation peak are deconvolved...” makes no sense. The first “deconvolving” should probably be eliminated.

In the brief description of drawings, Figure 3 is described as "a depiction of the optical arrangements for making holograms" (paragraph 6). From the way it is referenced in paragraph 18, Figure 3 appears to be a depiction of the optical arrangements for reading out holograms, not making them.

Appropriate correction is required.

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The title of the invention is "Multi-layer Holographic Data Recording Method," but nothing in the specification or the claims addresses the recording of data. Instead, the invention deals with the reading of data.

Claim Objections

4. Claims 19 and 21 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form

Claim 19 contradicts the previous claims 13 and 17 because cross-polarized light does not interfere. Claims 13 and 17 require "an interference pattern between two beam of light," but claim 19 states "wherein the two beams of light are crossed polarized with respect to one another." If they are cross polarized, there is no interference pattern as required by the previous claims.

Claim 21 depends on claim 19 and hence is objected to for the same reason. Accordingly, claims 19 and 21 have not been further treated on the merits.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bardos (U.S. Patent Number 4,256,362) in view of Curtis et al (U.S. Patent Number 5,339,305).

Regarding Claim 1, Bardos discloses a method of reading a set of data stored in a memory device, the method comprising:

causing a first optical beam 21 to interfere with a second optical beam 22 at a prescribed angle there between at a first selected hologram containing at least a segment of the set of data (column 3, lines 19-20) and having a discrete location (the linear portion of the film; column 3, lines 23-24) and a corresponding address (the holograms are recorded in specific lines on the film; column 1, lines 26-30) in the memory device 14, generating thereby an N^{th} diffraction order wavefront (the light transmitted through the hologram; column 5, line 12);

wherein the first and second optical beams are characterized by a wavelength, an optical path length, and a state of polarization (inherent to any optical beam);

sensing the N^{th} diffraction order wavefront diffracted from the hologram (done by the the photodetector 15, where as specified in column 5, lines 12-23, Bardos'

photodetector 15 senses all the light produced from the hologram, necessarily including the diffracted light);

and reading the set of data corresponding to the selected hologram and contained in the deconvolved N^{th} diffraction order wavefront (column 5, lines 63, through column 6, line 12, bearing in mind that what Bardos refers to as "demodulation" is a deconvolution of the data).

Bardos does not disclose "correlating the N^{th} diffraction order wavefront with a correlation pattern which includes the set of data, where N is an integer; and, if a correlation peak occurs, deconvolving the N^{th} diffraction order wavefront and the correlation pattern."

However, note that the wavefront generated in Bardos is an N^{th} diffraction order wavefront, where N is an integer (in column 1, lines 36-40, Bardos states that the light of interest is the first order diffracted beam).

Curtis et al. discloses an optical correlator in which the N^{th} diffraction order wavefront (the wavefront diffracted from hologram 12) and a correlation pattern which includes the set of data 14 are correlated (at output plane 18).

Curtis et al. later discloses electronics for processing correlations (column 6, line 21-24). This obviously includes checking for a correlation peak, and, if a peak occurs, deconvolving the N^{th} diffraction order wavefront and the correlation pattern.

Curtis et al discloses a whole range of uses for optical correlation (column 13, lines 33-45). For example, Curtis et al discloses that optical correlation might be useful in access-control through facial identification.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Bardos to include correlating the N^{th} diffraction order wavefront which includes the set of data, where N is an integer, as taught by Curtis, and if a correlation peak occurs, deconvolving the N^{th} diffraction order wavefront and the correlation pattern.

The motivation would have been any of the benefits disclosed by Curtis et al. Take, for example, access-control through facial identification. It would have been obvious to modify Bardos to add this benefit. It would require checking for a correlation peak (to see if a match occurs between an input face and a stored face allowed access), and deconvolving the N^{th} diffraction order wavefront and the correlation pattern (to record which individual face requested access).

With respect to claim 3, Bardos discloses in column 4, lines 5-7, that the first optical beam has a frequency ω_1 and the second optical beam has a frequency ω_2. Thus the two beams have different wavelengths.

7. Claim 2 rejected under 35 U.S.C. 103(a) as being unpatentable over Bardos and Curtis et al. as applied to claim 1 above, and further in view of Fowles (Introduction to Modern Optics, 2nd edition, 1989).

Bardos in view of Curtis discloses the method of reading a set of data as discussed above.

Bardos in view of Curtis does not disclose "wherein the first optical beam and the second optical beam emanate from an extended light source or a light source with a broad spectral composition."

Fowles discloses causing a first optical beam (from slit S_1) to interfere with a second optical beam (from slit S_2) wherein the first optical beam and the second optical beam emanate from a source with a broad spectral composition (sunlight, or any bright source, disclosed in the first paragraph of section 3.2, page 59).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Bardos in view of Curtis to include the use of two beams emanated from a light source with a broad spectral composition as taught by Fowles. The motivation would have been to avoid the expense or complexity of using a laser light source.

8. Claim 4 rejected under 35 U.S.C. 103(a) as being unpatentable over Bardos in view of Curtis et al. as applied to claim 1 above, and further in view of Mezrich (U.S. Patent Number 3,767,285; disclosed in IDS).

Bardos in view of Curtis discloses the method of reading a set of data as discussed above.

Bardos in view of Curtis does not disclose "reading the set of data corresponding to a second selected hologram and in the N^{th} diffraction order wavefront by changing the optical path length of one optical beam with respect to the other."

Mezrich discloses a recording medium 16 and reading the set of data corresponding to a second selected hologram (there are N^2 holograms on recording medium 16, disclosed in column 1, lines 55-56) and in the N^{th} diffracted order wavefront (the wavefront of equation 10) by changing the optical path length of one beam with

respect to the other (done by the beam deflector 12 and the hologram array 14. This is described in column 2, lines 21-25 for recording).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Bardos in view of Curtis to include the recording medium and method of reading from it of Mezrich. The motivation would have been to be able to read from any one of many holograms, improving storage capacity.

9. Claim 7 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bardos in view of LaMacchia et al. (Applied Optics, Vol. 7, No. 1, January 1968).

Regarding Claim 7, Bardos discloses a method of reading a set of data stored in a memory device, the method comprising:

causing a first optical beam 21 to interfere with a second optical beam 22 at a prescribed angle there between at a first selected hologram having a discrete location (the linear portion of the film; column 3, lines 23-24) and a corresponding address (the holograms are recorded in specific lines on the film; column 1, lines 26-30) in the memory device 14, generating thereby an interference pattern (column 4, lines 52-54);

wherein the first and second optical beams are characterized by a wavelength, an optical path length, and a state of polarization (inherent to any optical beam);

sensing an N^{th} diffraction order wavefront diffracted from the hologram, where N is an integer (done by the the photodetector 15, where as specified in column 5, lines 12-23, Bardos' photodetector 15 senses all the light produced from the hologram, necessarily including the diffracted light);

and reading the set of data in the deconvolved N^{th} diffraction order wavefront (column 5, lines 63, through column 6, line 12, bearing in mind that what Bardos refers to as "demodulation" is a deconvolution of the data).

Bardos does not specifically disclose (1) "wherein the N^{th} diffraction order wavefront includes a correlation peak signal and the holographically stored data of the "sensing" step. Bardos also does not specifically disclose (2) "correlating the holographically stored data and the correlation peak signal in the N^{th} diffraction order wavefront, and if a correlation peak occurs, deconvolving the holographically stored data and the correlation peak signal."

LaMacchia et al. discloses (1) reading a hologram (Fig. 1) wherein the N^{th} diffraction order wavefront (the virtual image wavefront, discussed on page 92) includes a correlation signal and the holographically stored data (the autocorrelation term in LaMacchia's equation 8 includes both). LaMacchia et al. further discloses (2) correlating the holographically stored data and the correlation peak signal in the N^{th} diffraction order wavefront (done in the autocorrelation term of equation 8), and if a correlation peak occurs (if the peak signal intensity, equation 12, is high enough), deconvolving the holographically stored data and the correlation peak signal (the stored data is only distinguishable from noise if the peak signal intensity is high enough, as discussed on page 92, in which case the signal is deconvolved). LaMacchia does this in order to read one individual hologram from a media with many superimposed holograms, improving storage capacity.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Bardos in view of LaMacchia et al. to include (1) reading a hologram in which the N^{th} diffraction order wavefront includes a correlation signal and the holographically stored data, and (2) correlating the holographically stored data and the correlation peak signal in the N^{th} diffraction order wavefront, and if a correlation peak occurs, deconvolving the holographically stored data and the correlation peak signal, as taught by LaMacchia above. The motivation would have been to be able to read one individual hologram from a media with many superimposed holograms, improving storage capability.

With regards to claim 9, Bardos discloses in column 4, lines 5-7, that the first optical beam has a frequency ω_1 and the second optical beam has a frequency ω_2. Thus the two beams have different wavelengths.

10. Claim 8 rejected under 35 U.S.C. 103(a) as being unpatentable over Bardos and LaMacchia et al. as applied to claim 7 above, and further in view of Fowles.

Bardos in view of LaMacchia et al. discloses the method of reading a set of data as discussed above. Note that Bardos in view of LaMacchia reads the data by creating interference between two beams of light.

Bardos in view of LaMacchia et al. does not disclose "wherein the first optical beam and the second optical beam emanate from an extended light source or a light source with a broad spectral composition."

Fowles discloses causing a first optical beam (from slit S_1) to interfere with a second optical beam (from slit S_2) wherein the first optical beam and the second optical

beam emanate from a source with a broad spectral composition (sunlight, or any bright source, disclosed in the first paragraph of section 3.2, page 59).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Bardos in view of LaMacchia to include the use of two beams emanated from a light source with a broad spectral composition as taught by Fowles. The motivation would have been to avoid the expense or complexity of using a laser light source.

11. Claim 10 rejected under 35 U.S.C. 103(a) as being unpatentable over Bardos in view of LaMacchia et al. as applied to claim 7 above, and further in view of Mezrich.

Bardos in view of LaMacchia et al. discloses the method of reading a set of data as discussed above.

Bardos in view of LaMacchia does not disclose "reading the set of data corresponding to a second selected hologram and in the N^{th} diffraction order wavefront by changing the optical path length of one optical beam with respect to the other."

Mezrich discloses a recording medium 16 and reading the set of data corresponding to a second selected hologram (there are N^2 holograms on recording medium 16, disclosed in column 1, lines 55-56) and in the N^{th} diffracted order wavefront (the wavefront of equation 10) by changing the optical path length of one beam with respect to the other (done by the beam deflector 12 and the hologram array 14. This is described in column 2, lines 21-25 for recording).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Bardos in view of LaMacchia to include the recording medium and

method of reading from it of Mezrich. The motivation would have been to be able to read from any one of many holograms, further improving storage capacity (LaMacchia taught superimposing holograms, but teaches that there is a limit to how many holograms can be superimposed in one place; Mezrich then allows for even more capacity).

12. Claims 13-14, 17-18, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bardos in view of Reis et al. (U.S. Patent Number 5,877,875).

Regarding claim 13, Bardos discloses:

means (Fig. 1) for creating an interference pattern between two beams of light (21 and 22) at a selected memory location in the recording media 14, generating thereby an N^{th} diffraction order wavefront;

means 15 for sensing the N^{th} diffraction order wavefront emanating from the selected memory location; and

means (Fig. 1) for reading the holographically stored data from the N^{th} diffraction order wavefront.

Bardos does not disclose a plurality of recording media "containing a set of holographically recorded data at discrete memory locations therein wherein each memory location is identified by a corresponding memory address."

Reis discloses a plurality of storage media containing a set of holographically recorded data at discrete memory locations wherein each memory location is identified by a corresponding memory address (see Fig 1: 10, 12, 14, etc., and column 2, lines

16-27). Reis further discloses having a plurality of storage data media to increase total storage capacity (see column 1, lines 56-59).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the device of Bardos for using multiple storage media instead of using a single storage medium. The motivation would have been to increase the total storage capacity as described by Reis.

With regards to claim 14, Bardos does not but Reis does disclose use of memory access media (16, 18, 20, etc., are visible in Fig. 1 of Reis) alternately interleaved between the plurality of recording media (10, 12, 14, etc.), for allowing access to the data recorded at the discrete memory locations.

It would have been obvious to one of ordinary skill in the art at the time of the inventionto modify Bardos to include memory access media alternately interleaved between the plurality of recording media as taught by Reis. The motivation would have been to allow access to the data recorded at the discrete memory locations.

With regards to claim 17, Bardos discloses wherein means for creating an interference pattern between two beams of light comprises a coherent source of light (light source 10 may be a laser, which is inherently coherent, column 3, lines 16-17).

With regards to claim 18, the two optical beams of Bardos each have a different wavelength (column 3, lines 47-49).

With regards to claim 20, Bardos discloses means to change the wavelength of the first beam of light or the second beam of light (column 3, lines 49-53, a frequency shifting device such as a suitable acousto-optic element).

13. Claim 16 rejected under 35 U.S.C. 103(a) as being unpatentable over Bardos and Reis as applied to claim 13 above, and further in view of Fowles.

Bardos in view of Reis discloses the method of reading a set of data as discussed above. Note that Bardos in view of Reis reads the data by creating interference between two beams of light.

Bardos in view of Reis does not disclose "wherein means for creating an interference pattern between two beams of light comprises an extended light source or a light source with a broad spectral composition."

Fowles discloses means for creating an interference pattern (at point P) between two beams of light (from slits S_1 and S_2) comprises an extended light source or a light source with a broad spectral composition (sunlight, or any bright source, disclosed in the first paragraph of section 3.2, page 59).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Bardos in view of Reis so that means for creating an interference pattern between two beams of light comprises an extended light source or a light source with a broad spectral composition. The motivation would have been to avoid the expense or complexity of using a laser light source.

14. Claim 22 rejected under 35 U.S.C. 103(a) as being unpatentable over Bardos in view of Reis as applied to claim 13 above, and further in view of Messinger.

Bardos in view of Reis disclose a memory device for reading data as described above.

Bardos and Reis does not disclose "wherein means for reading the holographically stored data from the N^{th} diffraction order wavefront is in communication with a distributed computer network, the network including network devices configured to execute program software allowing the devices to send, receive, record, store, or process original, compressed and decompressed holograms or sets of data between and amongst themselves via the network."

Messinger discloses a distributed computer network, the network including devices configured to execute program software allowing the devices to send, receive, store, or process original, compressed and decompressed sets of data between and amongst themselves via the network (background of the invention: column 1, lines 20-46). Note also that Messinger discloses that the network allows personal computers to use data stored in data storage memory devices belonging to the network ("network mass storage subsystems," column 1, line 31).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the data storage memory device of Bardos in view of Reis to have the reading means of Bardos' device being in communication with a distributed computer network capable of sending data as taught by Messinger. The motivation would have been to achieve the benefit of allowing any user to have access to the read out data at any computer station in the network.

Allowable Subject Matter

15. Claims 5-6, 11-12, and 15 are objected to as being dependent upon rejected base claims, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Curtis et al (U.S. Patent Number 5,719,691) discusses phase correlation multiplexing. Edwards (U.S. Patent Application Publication US 2002/0136143 A1) discloses recording media sandwiched between memory access layers. Jenkins et al. (U.S. Patent Number 5,416,616) uses multiple coherent pairs of beams that are incoherent with other pairs to record holograms. Kawano et al. (U.S. Patent Number 6,452,890) discusses optical correlation. Kawano et al. (U.S. Patent Application Publication US 2002/0163 873) has a plurality of recording media alternately interleaved between memory access layers. Wullert and Delfyett (IEEE Photonics Technology Letters, Vol. 6, No. 9, September 1994, pages 1133-1135) disclose using a broadband light source to read information from a stacked optical storage interleaved between wavelength-specific mirrors.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher R. Lamb whose telephone number is (572) 272-5264. The examiner can normally be reached on 8:30 AM to 5:00 PM Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hoa Nguyen can be reached on (571) 272-7579. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

CRL 9/28/05

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